

Amendments to the Claims

- Claim 1. (currently amended) A biometric sensing apparatus, comprising:
- a piezoelectric ceramic sensor having a plurality of piezoelectric ceramic elements arranged in an array, ~~each of said elements having an impedance that varies according to an applied load, said piezoelectric ceramic elements of said array being spaced on a pitch equal to or less than approximately 50 microns~~ said sensor operating in an impedance mode and detecting to detect features of a finger proximate to said sensor array; and
- a processor, coupled to said sensor, that receives an input from said sensor representative of features of the finger and produces an output.
- Claim 2. (original) The apparatus of claim 1, wherein said output is data representing a fingerprint pattern.
- Claim 3. (original) The apparatus of claim 1, wherein said output is data representing a portion of a finger ridge.
- Claim 4. (original) The apparatus of claim 1, wherein said output is data representing an arteriole-veinal map.
- Claim 5. (original) The apparatus of claim 1, wherein said output is data representing a bone map.
- Claim 6. (original) The apparatus of claim 1, wherein said output is data representing blood flow.
- Claim 7. (currently amended) The apparatus of claim ~~1~~ 6, wherein said output is data representing arteriole blood flow.

Claim 8. (currently amended) The apparatus of claim ~~1~~ 6, wherein said output is data representing capillary blood flow.

Claim 9. (currently amended) The apparatus of claim ~~1~~ 6, wherein said output is data representing a ratio of arteriole and capillary blood flow.

Claims 10-17 (cancelled)

Claim 18. (original) The apparatus of claim 1, wherein said sensor and said processor are packaged together as an integrated circuit.

Claims 19-22 (cancelled)

Claim 23. (original) The apparatus of claim 1, further comprising:
a multiplexer that couples said sensor to said processor.

Claims 24-53 (cancelled)

Claim 54. (currently amended) A biometric sensing apparatus, comprising:
a ~~piezoelectric~~ sensor having at least one hundred thousand approximately rectangular piezoelectric ceramic elements, each piezoelectric ceramic element having a size equal to or less than approximately forty microns by forty microns by one hundred microns, said sensor being responsive to features of a finger proximate to said sensor, ~~said sensor operating in an impedance mode to produce impedance data~~; and
a processor, coupled to said sensor, that ~~comprises an impedance detector that processes impedance data received~~ receives data from said sensor and produces an output representative of features of the finger.

Claims 55-62 (cancelled)

- Claim 63. (previously amended) The apparatus of claim 54, wherein said output is data representing a fingerprint pattern.
- Claim 64. (currently amended) The apparatus of claim 54, wherein said sensor further operates in a Doppler-shift mode to produce Doppler-shift data, and said processor includes a Doppler-shift detector that processes Doppler-shift data received from said sensor to produce a second output.
- Claim 65. (previously amended) The apparatus of claim 64, wherein the second output is data representing blood flow.
- Claim 66. (previously amended) The apparatus of claim 65, wherein the second output is data representing arteriole blood flow.
- Claim 67. (previously amended) The apparatus of claim 65, wherein the second output is data representing capillary blood flow.
- Claim 68. (currently amended) The apparatus of claim 54, wherein said sensor further operates in an echo mode to produce echo data, and said processor includes a signal-time-of-travel detector that processes echo data received from said sensor to produce a second output.
- Claim 69. (previously added) The apparatus of claim 68, wherein the second output is data representing an arteriole-veinal map.
- Claim 70. (previously added) The apparatus of claim 68, wherein the second output is data representing a bone map.
- Claim 71. (currently amended) The apparatus of claim 54, wherein said sensor further operates in a voltage mode to produce voltage data, and said processor

includes a voltage detector that processes voltage data received from said sensor to produce a second output.

- Claim 72. (previously added) The apparatus of claim 71, wherein the second output is data representing a fingerprint pattern.
- Claim 73. (previously added) The apparatus of claim 1, wherein said processor includes an impedance detector that processes the input received from said sensor to produce the output.
- Claim 74. (previously added) The apparatus of claim 73, wherein the output is data representing a fingerprint pattern.
- Claim 75. (currently amended) The apparatus of claim 1, wherein said sensor **further** operates in a Doppler-shift mode to produce Doppler-shift data, and said processor includes a Doppler-shift detector that processes Doppler-shift data received from said sensor to produce a second output.
- Claim 76. (previously added) The apparatus of claim 75, wherein the second output is data representing blood flow.
- Claim 77. (previously added) The apparatus of claim 76, wherein the second output is data representing arteriole blood flow.
- Claim 78. (previously added) The apparatus of claim 76, wherein the second output is data representing capillary blood flow.
- Claim 79. (currently amended) The apparatus of claim 1, wherein said sensor **further** operates in an echo mode to produce echo data, and said processor includes a signal-time-of-travel detector that processes echo data received from said sensor to produce a second output.

- Claim 80. (previously added) The apparatus of claim 79, wherein the second output is data representing an arteriole-veinal map.
- Claim 81. (previously added) The apparatus of claim 79, wherein the second output is data representing a bone map.
- Claim 82. (currently amended) The apparatus of claim 1, wherein said sensor further operates in a voltage mode to produce voltage data, and said processor includes a voltage detector that processes voltage data received from said sensor to produce a second output.
- Claim 83. (previously added) The apparatus of claim 82, wherein the second output is data representing a fingerprint pattern.
- Claim 84. (previously added) The apparatus of claim 1, further comprising:
an input signal generator that applies an AC voltage signal across said plurality of piezoelectric ceramic elements.
- Claim 85. (currently amended) The apparatus of claim 54, ~~wherein said piezoelectric sensor comprises a plurality of piezoelectric ceramic elements, and said apparatus further comprises~~ comprising:
an input signal generator that applies an AC voltage signal across said at least one hundred thousand approximately rectangular piezoelectric ceramic elements.
- Claim 86. (new) A biometric sensing apparatus, comprising:
sensor means for detecting a print ridge pattern of a finger proximate to said sensor; and
a processor, coupled to said sensor, that receives an input from said sensor and produces an output representative of the print ridge pattern of the finger.

- Claim 87. (New) The apparatus of claim 86, wherein said sensor comprises an array of piezoelectric ceramic elements.
- Claim 88. (New) The apparatus of claim 87, wherein said array comprises at least 100,000 piezoelectric ceramic elements.
- Claim 89. (New) The apparatus of claim 88, wherein said piezoelectric ceramic elements of said array are spaced on a pitch equal to or less than approximately 50 microns.
- Claim 90. (New) The apparatus of claim 89, wherein said array is large enough to obtain data representing a fingerprint pattern.
- Claim 91. (New) The apparatus of claim 90, wherein said array comprises a sonic barrier between each of said piezoelectric ceramic elements.
- Claim 92. (New) The apparatus of claim 91, wherein said sonic barrier is air.
- Claim 93. (New) The apparatus of claim 91, wherein said sonic barrier is an epoxy containing micro-spheres.
- Claim 94. (New) The apparatus of claim 93, wherein said micro-spheres are vinyl.
- Claim 95. (New) The apparatus of claim 86, wherein said sensor means and said processor are packaged together as an integrated circuit.